

FIRE/RESCUE STATIONS

Highlights

- ♦ Fire and emergency medical service (EMS) calls are anticipated to increase from over 27,000 calls (2002), to between 39,000 and 48,000 calls by 2022. This would be a 44 to 78 percent increase in calls for service.
- ♦ Calls for service should increase the most in older, developed areas.
- ♦ Six new fire/rescue stations may be needed by 2022.
- ♦ By 2022, five existing fire stations should be expanded.

Introduction

This Plan element is concerned with planning fire/rescue stations, for effective and efficient fire protection and EMS services. This section recommends construction of six new fire/rescue stations, and expansion of five existing fire stations, by 2022.

Existing Facilities

There are currently 18 fire/rescue stations and eight volunteer rescue stations in the county. In 2002, these stations responded to approximately 27,000 calls for service. Twelve fire/rescue stations have fire apparatus and ambulances, while six stations do not have ambulances. All stations provide first response basic and advanced life support EMS services. Fire/EMS and the volunteer rescue squad agencies provide seamless, integrated emergency medical service without respect to individual station and agency affiliation or district boundaries. Fire/EMS effectiveness is greatly influenced by staffing, organization, and equipment.

Existing Facilities (Background/Analysis)

Volunteer Rescue Squads: Volunteer rescue squads are an important part of the overall EMS network. Since 1995, volunteer rescue squad districts have responded to a decreasing number and share of EMS calls (8,580 ambulance calls in 1995, versus 7,651 calls in 2002). During the same timeframe, county fire staff have responded to a growing number and share of EMS calls (6,118 calls in 1995, versus 12,358 calls in 2002).

Automatic and Mutual Aid: The county maintains an automatic aid agreement with Colonial Heights, Petersburg, Powhatan County, and Richmond. Automatic aid means that resources are automatically dispatched to and from these localities. The county maintains a mutual aid agreement with Amelia, Dinwiddie, Henrico, and Prince George Counties, as well as with Hopewell and the Defense Supply Center-Richmond. Mutual aid means that the resources are dispatched to and from these entities upon request.

Fire Safety: The Fire/EMS Department also seeks to reduce demand for fire and rescue services through a proactive fire prevention and safety program. The department's Plans Review section reviews and inspects all new and renovated commercial construction for built-in fire protection systems. Public schools and businesses are also regularly inspected for compliance with fire safety codes. Permits for open burning, fireworks and blasting are issued and monitored. Free smoke detectors and installations are available through a program supported by local businesses and grants.

Fire and Rescue Service Areas: The Fire/EMS Department currently divides the county into 18 fire and 15 rescue districts. One county fire station serves each fire district, which range in size from 7.5 square miles (Bensley), to 74 square miles (Winterpock). Each rescue district is served by either a fire station with an ambulance, or by a volunteer rescue squad. County stations serve seven rescue districts, and volunteer rescue squads serve eight districts. Rescue districts range in size from 2.6 square miles (Bensley-Bermuda Volunteer Rescue Squad Station 2), to 92.7 square miles (Winterpock).

Staffing: County fire/rescue stations are staffed in four separate ways:

- **Career** (six stations): paid county staff only
- **Combination** (eight stations): paid county staff and volunteer staff (with a separate management structure for volunteers)
- **Integrated** (three stations): paid county staff and volunteer staff (without a separate management structure for volunteers)
- **Volunteer** (one station): volunteer staff exclusively

Volunteer staffing can affect if and when a fire/rescue station operates ambulance service. Four county fire stations (Bon Air, Buford, Ettrick, and Wagstaff) operate ambulances during weekdays only, supplementing volunteer rescue squad ambulance staffing. These stations use paid staff and fire apparatus to first respond to certain EMS calls both when staffing an ambulance and during nights and weekends when the rescue squad volunteers maintain coverage in their respective areas.

1995 Public Facilities Plan (Background/Analysis)

The 1995 Public Facilities Plan estimated that by the year 2000, there would be approximately 20,000 Fire/EMS calls for service. In reality, the county received almost 26,000 calls for service in 2000. The 1995 Plan recommended construction of eight new fire/rescue stations to serve system deficiencies and new growth through the year 2015. Three of these stations have been built: Centralia, Swift Creek, and Winterpock. One station (Rivers Bend) is currently under construction. In addition, land has been acquired and money allocated for a station in the Courthouse Road/Reams area.

Emergency service demands have increased much faster than anticipated by the 1995 Plan. As a result, the number of Fire/EMS calls answered by each station has increased by an average of 365 calls per station, and average emergency response times have increased by 28 percent since 1995. Fire/EMS calls per capita grew by 68 percent in the past decade, or more than three times faster than population growth. EMS calls have increased most, by 193 percent since 1992. This trend reflects aging populations and growing consumer demands for ambulance service for non-emergency situations.

Level of Service

The primary level of service indicator for fire and EMS is response time. The Fire/EMS level of service standard is: respond to 90 percent of all Priority 1 Fire/EMS emergencies in the urban corridor within six (6) minutes. The urban corridor is determined by the Fire/EMS Department, and includes most developed areas in the county. Areas outside of the urban

corridor are typically rural areas requiring greater driving distance for emergency response. The six-minute service standard includes one minute for 911 call processing and dispatch, one minute for first responder vehicle rollout, and four minutes driving time. Most (87 percent) emergency service calls originate inside the urban corridor. Only 43 percent of Priority 1 urban corridor Fire/EMS calls achieved the six-minute response standard.

Level of Service Standards (Background/Analysis)

The six-minute fire response standard is based on research by the National Fire Protection Association for the average time of structural fire flashover. "Fire flashover" is a measure of the critical point when an uninterrupted fire produces sufficient heat and fire gas levels to cause all contents in a room to combust spontaneously – almost always causing death of a person trapped in such a room. The six-minute EMS response standard is based on cardiac arrest survival research conducted by the American Heart Association. This research indicates that brain death and permanent death start to occur within four to six minutes after someone experiences cardiac arrest.

Findings

Existing System Conditions: The following table summarizes key Fire/EMS indicators from 1992 to 2002.

Fire/EMS Service Indicators

	1992	1995	2000	2002	1992-2002 Change
Population (July 1)	224,250	240,100	261,300	274,500	22%
Fire Calls	9,257	11,235	14,771	14,975	62%
EMS Calls (by firefighters)	4,214	6,118	11,108	12,358	193%
Total Calls	13,471	17,353	25,879	27,333	103%
Total Calls Per Capita	.060	.072	.099	.099	65%
Call Response Time (minutes)					
Fire	n/a	n/a	8.0	7.9	n/a
EMS	n/a	7.6	8.2	8.0	n/a
All Calls	n/a	6.3	8.2	8.1	n/a
Priority 1 Urban Corridor Calls	n/a	n/a	6.8	6.6	n/a
Response Within 6 minutes – EMS only	52.9%	47.9%	44.3%	46.9%	(11.3%)
Fire/Rescue Stations	15	15	17	18	3
Calls Per Station	898	1,157	1,522	1,518	620

Fire/EMS calls are increasing faster than new facilities and emergency service resources. In addition, fire and rescue response times have increased over the past decade. In 1995, the average response time for all Fire/EMS calls countywide was 6.3 minutes. By 2002, the average response times for all calls had increased to 8.1 minutes.

Call Loading (Background/Analysis)

The Fire/EMS Department has traditionally employed a benchmark indicator for fire station capacity and call loading of 1,000 calls for service per year per station.

This is not a level of service standard, but rather indicates demands on the overall system compared to existing resources. This benchmark does not accurately gauge the ability of individual fire/rescue stations to respond quickly to urban corridor calls. The four busiest stations (which all provide 24 hour ambulance service) had an average of about 3,200 emergency calls in 2002, with average response times of 6.57 minutes for Priority 1 urban corridor calls. Other stations received an average of about 1,300 calls, yet had slightly slower response times. This comparison illustrates that heavy call loading alone does not determine response times.

Fire/EMS service areas (measured by driving distance) overlap, and stations with greater staff and equipment resources (such as 24 hour ambulances) are capable of handling more calls for service. Stations with less equipment and fewer staff resources do not have the ability to respond to multiple simultaneous calls. This situation has spillover effects on the larger system, since adjacent stations must "fill-in" to respond to peak demand periods at under-equipped stations (which in turn reduces response capability of other stations).

Growth Impacts: Additional factors for planning new fire/rescue facilities include population projections and per capita emergency call rates for different areas of the county. Factors affecting call generation include demographics and development patterns. Older communities, where most housing was built prior to 1980, generally have higher call rates, reflecting aging populations with higher EMS demands and older structures more prone to fire. Communities with older housing produced an average of .122 emergency calls per capita in 2002. In contrast, communities with newer housing (with an average construction year after 1985) have significantly lower emergency call rates (averaging .067 calls per capita). High growth areas tend to have newer housing and younger residents, requiring fewer Fire/EMS resources. As a result, facility planning for fire/rescue stations does not follow the normal pattern of concentrating most new facilities in newly developing areas.

Response Deficiencies: Approximately half of all Fire/EMS calls were Priority 1 urban corridor calls in 2002. Most (79 percent) Priority 1 urban corridor calls exceeding the six-minute standard were located within four-minute driving distance of existing fire/rescue stations. This suggests that the primary cause of slow response times is not the lack of a nearby fire/rescue station. Response times appear to be more closely related to operational issues such as staffing, equipment, call loading, and the size of rescue districts.

Service Areas: Within the urban corridor, Priority 1 EMS response times averaged 6.06 minutes in the four smallest rescue service areas (all of which have ambulances). Response times in larger rescue districts (some of which do not have ambulances) averaged 6.31 minutes. This suggests that proximity of fire/rescue stations with ambulances may improve EMS response times. Fire response times in the urban corridor do not appear to be related to the size of individual fire station service districts. Fire stations with the smallest districts had response times for fire calls that were nearly identical to the 14 other fire stations serving larger fire districts.

Network Deficiencies: Although most (93 percent) Priority 1 urban corridor Fire/EMS calls are within four-minute driving distance of existing fire/rescue stations (including volunteer

rescue squads), there are still gaps in the service network. These areas cannot be reached within four-minute driving distance of existing county fire/rescue stations, suggesting a need for increased facilities and/or operational resources. However, some gap areas may not warrant new fire/rescue stations, due to the relatively low number of calls, better than average existing response times, or road network problems. It is important to note that some gap areas are partly served by volunteer rescue squads. However, these areas still lack adequate county fire service coverage.

It should be noted that the Fire and EMS Department is currently assessing non-facility solutions to improve service coverage. One example is the use of a "first response vehicle" that would not be permanently located at a Fire/EMS station, but would be temporarily located "on the street" in service gap areas.

Underserved Areas in the Urban Corridor
(Located Beyond Existing Fire/Rescue Station Driving Distance)

Generalized Service Area	2002 Priority 1 Calls
South Courthouse	654
South Jefferson Davis	383
Centralia/Salem Church	232
Lucks Lane/Smoketree*	170
North Bon Air	166
North Salisbury	81
North Woodlake	57

* Excludes service coverage provided by the new Courthouse Road station.

2002 Fire/EMS Call Activity in Service Area of Possible Stations

Service Area	Optimum Station Location	Total Fire/EMS Calls	Average Response Time	Priority 1 Urban Area Calls	Average Response Time
Centralia/Salem Church	Ironbridge/Centralia	2,116	8.39	1,152	7.12
South Courthouse	Courthouse/Rt. 288	2,031	8.01	1,135	7.17
North Bon Air	Buford/Bon View	1,865	7.13	1,041	6.16
South Jefferson Davis	Jeff Davis/Harrowgate	1,003	9.73	519	8.27
North Salisbury	Robious/Twin Team	732	7.17	387	5.14
South Courthouse	Newbys Bridge/Valencia	556	9.16	321	8.01
Lucks Lane/Smoketree	Lucks Lane/Walton Bluff	432	9.80	226	8.23
North Woodlake	Woolridge/Foxlight	234	10.11	94	7.94

Priority 1 Urban Area Calls overlap service areas of existing stations, and therefore exceed the number of calls indicated in Table 2.

Call Projections: Call projections were based on 2002 system-wide demands of 0.09975 Fire/EMS calls per capita. This rate was multiplied by estimated population growth in each community. This rate assumes that the number of countywide Fire/EMS calls will grow proportionally with population. A second set of projections was also considered, reflecting call rate increases exceeding population growth.

Call Projections (Background/Analysis)

Fastest Fire/EMS Call Growth By Community: 2007-2022

Community	Additional Calls By 2007	Additional Calls By 2012	Additional Calls By 2017	Additional Calls By 2022
Courthouse	354 to 515	665 to 1,017	992 to 1,565	1,348 to 2,172
Chester	306 to 455	578 to 903	859 to 1,387	1,166 to 1,928
Enon	250 to 338	468 to 661	703 to 1,017	953 to 1,405
Genito	179 to 277	340 to 555	502 to 853	681 to 1,185
Midlothian	239 to 291	441 to 555	671 to 856	910 to 1,176
Manchester	122 to 243	245 to 509	348 to 777	472 to 1,089
Meadowbrook	132 to 239	257 to 491	372 to 751	505 to 1,052

Facility Expansion Limitations (Background/Analysis)

Three urban corridor fire stations currently not providing ambulance service (Chester, Dutch Gap, and Manchester) have the potential to accommodate ambulance service by using existing station space or by physical expansion. Ambulance service at these stations would greatly improve EMS response capability for much of the existing urban corridor area. These stations are within or contiguous to communities expected to have significant Fire/EMS call growth.

The existing Enon and Midlothian fire stations have physical constraints to accommodate ambulances, crew, and related equipment. EMS call response in the Enon area should be improved by ambulance capability included in new Rivers Bend station. The Midlothian area will need increased ambulance capability that will not be provided by current or funded stations. Since improved ambulance service will be needed in the Midlothian area, station expansion or replacement will be necessary. If the existing station cannot be expanded to accommodate an ambulance, a replacement station will be needed.

Emergency Service to Low-Income Areas (Background/Analysis)

This analysis considered whether low-income areas had higher demands for Fire/EMS services. The results on this issue are inconclusive. The ten lowest income census tracts had higher than average emergency call rates (.21 emergency calls for service per capita in 2002). The ten highest income census tracts had .06 calls for service. However, most low-income census tracts include commercial areas and major roads (including Midlothian Turnpike, Chippenham Parkway, and Jefferson Davis Highway). These uses are not directly related to household income and inflate emergency call rates by 57%. For example, Census Tract 1001.07 (among the ten lowest income census tracts) is located between Buford Road and the Chippenham Parkway, north of the Midlothian Turnpike. In 2002, this tract had .178 emergency calls per capita. However, 56 percent of these calls were not residential calls, but were directly associated with the Midlothian Turnpike. If non-residential calls were excluded from per capita call figures, this tract had a lower-than-average emergency call rate in 2002.

In contrast, high-income census tracts tend to be mostly residential (such as Salisbury), without major commercial areas or highways, and therefore have fewer emergency calls and low per capita call rates.

Effect of Pending Stations (Background/Analysis)

The proposed Courthouse Road station (near Reams Road) will fill a critical network gap in the north Courthouse Road corridor. Within four-minute driving distance of the proposed station, the average response time for Priority 1 urban corridor calls is .55 minutes slower than the countywide average. In addition, this new station will cover about a third of the existing Lucks Lane/Smoketree service area gap.

The new Rivers Bend station should improve response times in the area between the existing Dutch Gap and Enon stations. Within the four-minute drive time radius of the proposed station, the average response time for Priority 1 urban corridor calls is 7.78 minutes (1.15 minutes slower than the countywide average). The new station will not greatly increase the four-minute response coverage of the nearby Dutch Gap and Enon stations. The primary benefit of the new station will be to provide ambulance service in a high EMS demand area (3,435 EMS calls in 2002). The Bensley-Bermuda Volunteer Rescue Squad (Station 1) now serves this area, and existing fire stations in the area (Chester, Dutch Gap, and Enon) do not provide ambulance service.

Locational Criteria

- Fire and EMS facilities should be co-located or coordinated for maximum efficiency.
- Stations should be located with quick access to a major arterial and, if possible, located near two major arterial roads offering both east-west and north-south travel.

Other Criteria

- New fire/rescue station sites should be five acres, to accommodate future expansion.
- Include a community meeting room for 50-100 persons in the design of new fire/rescue stations unless there is a similar facility available for the surrounding community.
- Mitigate impacts on nearby residential areas

Recommendations (Map 1)

The following recommendations should meet existing and future service demands. Priority should be given to stations in areas where the greatest number of urban corridor residents are currently served by response times exceeding six minutes. These recommendations promote Comprehensive Plan goals for sustaining neighborhoods by focusing most new facilities within existing developed areas. In summary, six to eleven new or expanded fire/rescue stations will be needed by the year 2022. These recommendations assume that the pending Rivers Bend and Courthouse Road fire/rescue stations will be completed.

The following table outlines the minimum number of new and/or expanded fire and rescue stations needed in five-year increments, based on existing per capita call rates. This table provides two facility scenarios, one based on stable per capita call rates, and one based on per capita call growth exceeding population growth rates. The first five stations would fill

significant existing gaps in the existing urban corridor network. The sixth station would improve overall service in proximity to major road networks.

Minimum Number of New or Improved Fire/Rescue Facilities Needed
Timing of need is based on countywide Fire/EMS calls per capita

New or Expanded Fire and Rescue Stations Needed	At .09975 Countywide Fire/EMS Calls Per Capita	At .105 Countywide Fire/EMS Calls Per Capita	At .111 Countywide Fire/EMS Calls Per Capita	At .116 Countywide Fire/EMS Calls Per Capita	At .122 Countywide Fire/EMS Calls Per Capita
By 2007	0	1	2	3	5
By 2012	2	3	4	6	7
By 2017	4	5	6	8	9
By 2022	6	7	9	10	11

2002-2022

Construct new fire/rescue stations to serve existing service gaps. Listed in order of priority.

- a. **Ironbridge/Centralia:** (vicinity of Ironbridge Road and Centralia Road). A feasibility study should determine if this station could replace the existing Airport Station.
- b. **Courthouse/Route 288:** (vicinity of Courthouse Road and Route 288).
- c. **Jefferson Davis/Harrowgate:** (vicinity of Jefferson Davis Highway and Harrowgate Road).
- d. **North Woodlake:** (vicinity of Woolridge Road and Foxlight Parkway).
- e. **Newbys Bridge/Valencia:** (vicinity of Newbys Bridge Road and Valencia Road). This station would be warranted when service area reaches 1,000 fire/EMS calls per year.

Construct new fire/rescue station to serve growth areas and expanded road network.

- f. **West Salisbury:** (vicinity of Route 288 and Route 60).

Improve fire/rescue stations to serve existing service gaps: Listed in order of priority

- g. **Manchester Fire Station:** Add full-time ambulance service to Manchester Fire Station.
- h. **Dale Fire Station:** Add full-time first response vehicle (FRV) to Dale Fire Station.
- i. **Midlothian Fire Station:** Add full-time ambulance service to Midlothian Fire Station. If the existing station cannot be expanded to add ambulance service, replace station in the same vicinity (between Old Buckingham Road and Charter Colony Parkway).
- j. **Dutch Gap Fire Station:** Add full-time ambulance service to Dutch Gap Fire Station.
- k. **Chester Fire Station:** Add full-time ambulance service to Chester Fire Station.

Post 2022: Construct new fire stations to serve growth areas

- l. **Otterdale/Old Hundred:** (vicinity of Otterdale and Old Hundred Roads).
- m. **Nash Road:** (vicinity of Nash Road, between Woodpecker and Beach Roads).
- n. **Branders Bridge:** (vicinity of Branders Bridge Road, between Bradley Bridge and Whitehouse Roads).

Benefits of Fire/Rescue Station Recommendations (Background/Analysis)

Ironbridge/Centralia: This station will serve system deficiencies Centralia/Salem Church service gap area, and anticipated growth in the Courthouse community. This station would provide call load relief to the Airport, Centralia, and Chester stations, and to the Bensley-Bermuda Volunteer Rescue Squad (Station 1).

Courthouse/Genito: This station will serve system deficiencies in the west half of the South Courthouse service gap area, and growth in the Genito community. This station would provide call load relief to the Airport, Clover Hill, Manchester, and Wagstaff stations.

Jefferson Davis/Harrowgate: This station will serve system deficiencies in the south Jefferson Davis corridor service gap area, and growth in the Chester and Enon communities. This station would provide call load relief to the Chester and Dutch Gap stations, and to the Bensley-Bermuda Volunteer Rescue Squad (Station 3).

North Woodlake: This station will serve system deficiencies and anticipated growth in the north Woodlake service gap area. This station would provide call load relief to the Clover Hill and Swift Creek fire/rescue stations, and to the Manchester Volunteer Rescue Squad (Station 2).

Newbys Bridge/Valencia: This station will serve system deficiencies in the east half of the South Rockwood service gap area. This station would provide call load relief to the Airport, Dale, and Manchester stations, and to the Manchester Volunteer Rescue Squad (Station 1).

West Salisbury: This station will serve system deficiencies and anticipated growth in the north Salisbury service gap area. The station would provide call load relief to the Bon Air and Midlothian stations, and to the Forest View Volunteer Rescue Squad (Station 2).

Manchester Fire Station: Ambulance service would provide call load relief to the Dale station, and to the Forest View (Station 3) and Manchester (Station 1) Volunteer Rescue Squads, and also serve anticipated call growth in the Manchester community.

Dale Fire Station: First response vehicle would allow the existing service area to be split into two districts, divided by Route 10. Additional service would provide call load relief to the Bensley station and the Bensley-Bermuda Volunteer Rescue Squad (Station 2), and also serve anticipated call growth in the Courthouse and Meadowbrook communities.

Midlothian Fire Station: Ambulance service would provide call load relief to the Forest View Volunteer Rescue Squad (Station 2), and also serve anticipated call growth in Midlothian.

Dutch Gap Fire Station: Ambulance service would provide call load relief to the Centralia station, and to the Bensley-Bermuda Volunteer Rescue Squads (Stations 1 and 3), and also serve anticipated call growth in the Chester and Enon communities.

Chester Fire Station: Ambulance service would provide call load relief to the Airport and Centralia stations, and to the Bensley-Bermuda Volunteer Rescue Squads (Stations 1 and 3), and serve anticipated call growth in the Chester and Courthouse communities.

Public Facilities Plan: Fire/EMS Recommendations (Map 1)

